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Engine Lathe for Engraving Surfaces, Printing and  
Coining Presses, &c.

PERKINS' SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JACOB PERKINS, late of Philadelphia, in the United States of America, but now residing at Austin Friars, in the City of London, Engineer, send greeting.

WHEREAS His most Excellent Majesty King George the Third did, by  
5 His Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland called England, bearing date at Westminster, the Eleventh day of October, in the fifty-ninth year of His reign, give and grant unto me, the said Jacob Perkins, my exors, admors, and assigns, His especial licence, full power, sole privilege and authority, that I, the said Jacob Perkins, my  
10 exors, admors, and assigns, during the term of years therein mentioned, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, the Invention, partly communicated to me by a certain foreigner when residing in America, and partly of my own Invention, of "CERTAIN MACHINERY AND IMPLEMENTS APPLICABLE TO ORNAMENTAL  
15 TURNING AND ENGRAVING; AND TO THE TRANSFERRING OF ENGRAVED OR OTHER WORK FROM THE SURFACE OF ONE PIECE OF METAL TO ANOTHER PIECE OF METAL, AND TO THE FORMING OF METALLIC DIES AND MATRICES; AND ALSO IMPROVEMENTS IN THE CONSTRUCTION AND METHOD OF USING PLATES AND PRESSES FOR PRINTING BANK NOTES AND OTHER PAPERS, WHEREBY THE PRODUCING AND COMBINING VARIOUS SPECIES  
20 OF WORK IS EFFECTED UPON THE SAME PLATES AND SURFACES, THE DIFFICULTY OF IMITATION INCREASED, AND THE PROCESS OF PRINTING FACILITATED; AND ALSO AN IMPROVED METHOD OF MAKING AND USING DIES AND PRESSES FOR COINING MONEY, STAMPING MEDALS, AND OTHER USEFUL PURPOSES;" in which said Letters Patent

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there is contained a proviso, that if I, the said Jacob Perkins, shall not particularly describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, by an instrument in writing under my hand and seal, and cause the same to be inrolled in His Majesty's High Court of Chancery within six calendar months next and immediately after the date of 5 the said Letters, that then the said Letters Patent, and all liberties and advantages whatsoever thereby granted, shall utterly cease, determine, and become void, as in and by the same, relation being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said 10 Jacob Perkins, do hereby declare that the nature of my said Invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the Drawings hereunto annexed, and the following description thereof (that is to say):—

In Drawing No. 1 is represented an engine lathe for engraving oval or 15 circular geometrical figures upon metal or other surfaces, whether flat, convex, or concave, in which Drawing (as well as in all the others) the same letters refer to the same parts of the different machines there represented.

Figure 1 is a front view of the lathe; Fig. 2, a front end view of the same, with the chucks and rest removed; Fig. 3, a back end view of the same; Fig. 4, 20 a section of the eccentric roller, and end of the upper mandrell; Fig. 5, an edge view of that roller; Fig. 6, the toothed wheel work viewed in front; Fig. 7, section of part of the toothed wheelwork; and Fig. 8, the adjusting chuck.

A, A, &c., the wooden frame or support of the lathe; B, the band wheel and its crank axis; C, C, &c., the bed of the lathe; D, D, cheeks fixed in the 25 lathe bed to support the swinging parts of the lathe; E, E, screwed pivots on which those parts swing; G, G, screws moving in the cheeks D, D, to hold the swinging parts still when the toothed wheelwork is thrown out of gear, and the lathe may be used as a common lathe; H, H, Figure 1, the lathe mandrell; I, the whorl or pulley; J, the main toothed wheel, with its sliding socket, which 30 can be fixed by a screw; K, the intermediate and connecting pinions, the arbor of which acts in the adjusting frame or bracket L, which is united with the swinging frame F, by the screw and nut M; N, the upper mandrell on which the several toothed wheels O, O, &c., which are fixed upon a sliding 35 mandrell; R, the collar of the lathe mandrell; S, its adjusting screw; T, the collar of the upper mandrell; U, its adjusting screw; V, the oval chuck formed as usual; W, the eccentric cylinder, and its moving plate X, which is connected with the swinging frame F by the adjusting screw and nuts Y, Y; Z, the



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adjusting chuck to hold the plates, blocks, &c., to be engraved. *a*, *a*, plate or block to be engraved; *b*, the roller, which slides upon an oblong square upon the end of the upper mandrell *N*, and can be moved more or less eccentric by means of the adjusting screw *C*, and secured firmly by a screw and nut upon the end of the mandrell; *d*, an arm screwed to the pillar *e*, which is fixed upon the bed of the lathe, and from which arm depend two vertical parts *f*, *f*, which hold a cheek *g*, let into a dovetailed groove in the part *f*, and an adjusting elastic cheek *h*, which is retained in its place by the steady pins *i*, *i*, and between which cheeks *g* and *h*, the eccentric roller *b* revolves, and causes the swinging parts of the lathe *F*, *F*, &c., to vibrate more or less, according to its eccentricity. The whorl *Q*, on the upper mandrell, receives motion from the lathe wheel, as shewn in Fig. 3. One of the toothed wheels *O* upon that mandrell works into the larger of the two intermediate pinions *K*, which are fixed upon one arbor *k*, whilst the smaller of those pinions work in the toothed wheel *J*, fixed upon the lathe mandrell, (as is more distinctly shewn in Fig. 6, which represents those wheels and pinions on a scale double the size of Fig. 1, 2, 3, and 8.) The turning or engraving tool *l* must be held in a slide rest *m*, with adjustments as usual in other engine lathes, and which, therefore, need not be described here. In order to produce a figure upon a flat, concave, or convex surface with this lathe, let one of the tooth wheels *O*, upon the upper mandrell having 132 teeth, be connected with the larger of the intermediate wheels *K*, fixed upon the arbor *k*, and having 58 teeth, and let the smaller of those wheels having 32 teeth, take into the toothed wheel *J* of 352 teeth, which is fixed upon the lathe mandrell *H*, *H*, and it will be found that four revolutions and five-sixths of another will be made by the wheel *O*, to to one revolution of the lathe mandrell *H*, *H*, and consequently six revolutions of the lathe mandrell *H*, *H*, will complete the figure upon the surface of the body to be operated upon, and this whether the figure be circular or oval, the latter depending upon the eccentricity of the oval chuck. The intermediate wheels *K* may be removed, and the largest of the wheels *O* can be connected with the wheel *J*, and will produce a different figure, which may be also varied by the eccentricity of the cylinder *W* being made greater or lesser, as well as by causing others of the toothed wheels and pinions to engage in each other, and thus an infinite variety of figures may be produced. In operating upon convex or concave surfaces, the turning tool in the slide rest ought to be acted upon by a spring and regulating gauge, so as to cause it to follow up the varying surfaces.

In Drawing No. 2 is represented an engine lathe for engraving certain figures upon the peripheries of metal or other cylinders.

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Fig. 1, a front view of the lathe, with part of its supporting frame removed; Fig. 2, an end view; Fig. 3, a plan of it, with the hand wheel and its carriage removed, and part of the wooden frame broken off; Fig. 4, a front view of some of the parts, the front of the carriage being removed to shew them more distinctly; Fig. 5, a section of the carriage and bracket or support of the intermediate arbor and mandrell, taken at the dotted line A, A, in Fig. 3; Fig. 6, parts of the toothed wheelwork shewn on an enlarged scale.

B, B, &c., parts of the supporting frame, the foot wheel, crank, axis, &c., being common to other lathes not been shewn; C, C, &c. the cast iron bed of the lathe; D, D, two upright metal blocks, firmly secured by screws 10 to the cast-iron bed; E, E, E, E, four cylindrical rollers of equal size, fixed in pairs upon the two spindles F, F, which have conical holes in their ends turning upon the conical points of the four adjusting screws G, G, G, G, as centres upon these four rollers E, E, &c.; the vibrating carriage of the lathe H, H, &c., is supported and guided by means of two short steel bars I, I, 15 which are affixed on the under side of the carriage, and move between four steel bars upon the upper surfaces of the block D, D, two of which bars are fixed, one of which is shewn at J in Fig. 2 and 4, and the others are moveable, as shewn at K, and are adjusted by the screws L, L; the motion of the carriage H, H, is thus secured in a line parallel to the axis of the 20 mandrell of the lathe. Four steel plates M, M, &c., are also fixed on the under side of the carriage H, H, which move upon the tops of the four rollers E, E, E, E. The larger conical end of the lathe mandrell N works in the steel collar O, secured to one end of the carriage, and its smaller end works in a conical hole made in the adjusting screw P to receive it. On the 25 larger end of the mandrell N is a male screw, on which the chucks are fixed, and it has also a pulley or whorl Q upon it, which is intended to receive motion occasionally by a band from the foot wheel; it has also a toothed contrate wheel R fixed to a sliding socket, with a binding screw S upon it, which gives motion to an intermediate pinion T at right angles to it, which is fixed 30 upon the arbor U, turning in pivot holes, one of which is in the bracket V, which is secured to the carriage by the binding and adjusting screw W, and has an arm X screwed to the upper part of it by the adjusting screw Y, and in which arm is the other pivot hole of the arbor U; on the same arbor U is likewise fixed the toothed wheel Z, by means of the screwed nut of its socket. 35 a, a, is an arbor, placed at right angles with the mandrell N, having a neck at one end of it with a shoulder working in and through the steel collar b, which is fixed to the side of the carriage H; and its other end has a conical hole turning upon the conical point of the adjusting screw c, as a centre; on the outer



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end of arbor *a, a*, is fixed the pully *d*, which receives motion by means of a band from the hand wheel *e*, which is supported on a carriage or frame *f*, fixed to the lathe bed; on the arbor *a, a*, is fixed a sliding socket *g*, with an adjusting screw *h*, and upon which socket are fixed the three toothed wheels *i, i, i*.

5 There is likewise fixed upon a square made upon the arbor *a, a*, a cylinder *j*, which can be moved eccentric by means of the adjusting screw *k*, and fixed in any situation between the shoulder of the arbor *a, a*, and the nut *l*, which is screwed upon the end of it. The cylinder *j* revolves between two steel upright plates *m* and *n*, the first of which *m* is firmly fixed by screws to one of the

10 blocks *d*, whilst the latter *n* is so fixed to it that its upper part, which is made sufficiently thin to be elastic, can yield a little, so as to prevent the excentric cylinder from binding or shaking between the plates *m* and *n*. When the arbor *a, a*, is turned round, and the cylinder *j* is eccentric with it, the carriage *H* will remain at rest; but on the cylinder being made eccentric to the

15 arbor, and as shewn in the Drawings, the carriage will vibrate backwards and forwards upon the four rollers *E, E, &c.*, double the distance of the eccentricity of the cylinder, and as the lathe mandrell is carried round at the same time by means of the train of toothed wheels before described, any cylindrical body screwed upon the end of the mandrell will receive waved lines upon its peri-

20 phery from the point of any proper turning tool fixed in a slide rest, as usual in engine laths, and therefore need not be described here, and which waved lines will vary accordingly as the cylinder is made more or less eccentric, the difference of the velocities of the mandrell *a, a*, and arbor *N*, made greater or lesser, and the diameter of the cylindrical body to be operated upon, or by any

25 one, two, or three of these charges being made together or separately. Thus, let the middle toothed wheel *i* of one hundred teeth upon the arbor *a, a*, in Fig. 3, be connected with the intermediate wheel *Z*, having 180 teeth, and let the pinion *T* of 32 teeth, fixed upon the same arbor *U* with the wheel *Z*, be connected with the contrate wheel *R* of 352 teeth fixed upon the lathe man-

30 drell *N*, then the difference of velocity between the toothed wheel *i* and the lathe mandrell *N* will be as 19 and four-fifths to 1, and as a motion backwards and forwards endways is given to the mandrell *N* at every revolution of the arbor *a, a*, so consequently nineteen and four-fifths waved lines will be made round the periphery of the cylindrical surface to be operated upon at each revo-

35 lution of the mandrell *N*, and as the last waved line falls short one-fifth at each revolution, it will take five revolutions of the mandrell *N* for the graving tool to enter again into the first waved line cut, when it would go over the same course again and deepen the lines, if necessary.

In Drawing No. 3, Fig. 1, represents the horizontal vibrating lever press,

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viewed in front; Fig. 2, an end section of the same, beyond the dotted line A, A, in Fig. 1, with the strengthening frame removed; Fig. 3, a top view, with all the parts in their situation, as in use; and Fig. 4, a top view, with the vibrating lever and parts attached to it removed. B, B, &c., the four upright sides of the frame of the press tenanted into the base or sill C, and strengthened by the cross beams D, D. Upon the top of the sides B, B, is the press bed E, E, which is secured to the sides by screws and nuts, and has two grooves or slits F, F, in it, for the two upright bars G, G, and H, H, to pass through and move freely therein backwards and forwards. The bar H, H, turns upon the pin or bolt I as a fulcrum, which is supported in blocks fixed 10 to the sides of the frame B, B. The bar H, H, passing through one of the grooves F on the press bed E, E, is connected by means of the joint with one end of the vibrating lever K, the other end of which is connected with the upper end of the upright bar G, G, by the joint L. The bar G, G, is connected with the lower horizontal lever M by the bolt N; this lever M moves 15 upon the bolt O as a fulcrum, which rests in one of the sides of the frame B. To the other end of the lever M is connected, by the joint P, the rod Q, Q, having firmly fixed in the middle of its upper end a short rounded plate of iron R, upon which the lever T presses, one end of which lever lodges under one of the pins or staves U, U, which are fixed in the side of the frame B and 20 the side piece V attached to it, and upon the other end of it the weight W hangs, and can be slid along it as required in use. The upper side of the lever T has a semicircular notch or gap in it at its end, which lodges under one of the pins or staves U, U; and in the under side of it, near that end, are made several other similar notches, any one of which can be placed 25 upon the rounded edge of the plate R of the rod Q, as may be required to encrease or lessen the pressure. The press bed E, E, is supported near its centre upon the top of the strengthening frame X, X, X, and has two ribs Y, Y, cast upon it, on which rests the adjustable bed Z, the under side of which is formed of a portion of a cylinder, and in the centre of it is screwed 30 the arm *a*, to which is jointed the socket or tube *b*, having a female screw within it, in which acts the male screw *c*, the cylindrical stem of which acts in a hole made in the plate *d*, which has two pivots moving in the ears *e*, *e*, which are screwed into the under side of the press bed, and thus allows sufficient play to those parts in use. The adjustable bed Z can be moved sideways, backwards, 35 and forwards, by turning the winch *f* of the screw *c*. Upon the adjustable bed Z is supported the bed *g*, by means of the four screws *h*, *h*, *h*, *h*, which are screwed into the bed *g*, and their heads project into four shallow circular holes made in the top of the adjustable bed Z to receive them, two of which are



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shewn at *i, i*, in Figure 2. Upon the upper face of the bed *g* is to be placed the copper or steel plate to receive the impression from the circular die or roller *j*, which is suspended from the under side of the middle of the vibrating lever *K*, in the manner now to be described. The die or roller *j* consists of a hollow steel cylinder, fitted upon a steel axis, which is formed into two cylindrical necks on each side of the roller, as shewn in Figure 4 at *k, k*; on the under side of the vibrating lever *K*, is secured, by screws, a brass bearing box *l*, in which are two semicircular gaps or notches, which receive the necks *k, k*, of the roller's axis; the roller *j* is kept up and prevented from falling out of these gaps by means of the wire stirrup *m*, which has two hooks at its lower ends, which take hold of those parts of the necks *k, k*, that extend beyond the bearing box *l*, and the stirrup itself hangs upon a wedge *n*, which is placed between it and the top of the vibrating lever *K*. Each end of the axis of the die or roller *j* is made square, on which squares fit the square gaps made in the ends of the die lever or double spanner *O*, & by means of which the die or roller can be turned backwards and forwards upon the surface of the steel or copper plate *w* lying upon the bed *g*, as aforesaid. When the weight *W* and the lever *T* are removed, the rod *Q* may be lifted up by means of its handle *p*, Fig. 2; in order, however, to facilitate this, and retain the rod at any required height, a counterbalancing weight *q* is suspended by the line *r*, which passes over the pulley *s*, and is connected with the longer end of the horizontal lever *M* by the loop *t*. In order to lessen the friction of the upright bars *G, G*, and *H, H*, in the grooves *F, F*, made in the press bed *E, E*, these grooves are covered with two brass plates *u, u*, having a corresponding groove in each, but which are made rather narrower than those grooves in the bed over which they are placed. These brass plates *u, u*, are firmly secured upon the bed by the screws *v, v*, &c. The length of this press ought to be at least fifteen feet, in order to allow the vibrating lever to move sufficiently near to a straight line to answer its intended purpose; the difference, however, between its motion and a straight line is compensated for partly by the materials, viz<sup>t</sup>, wood, of which its frame consists, but chiefly by the accommodating motion of the levers, and it therefore becomes necessary in using it, to place it so as to pass though the floor of the work room in which it is situated to the room below, and even to raise the floor of the work room by means of a platform, for the operator to stand upon, and as shewn in the Drawings.

In Drawing No. 4 is shewn an improved steel or copper plate or block printing press, Fig. 1 being a front view of it, and Fig. 2, an end view.

The principal improvements consist in a new method of heating the plate or block in the use of a tympan, for the purpose of saving the expence of making

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the plates or blocks any larger than is necessary to receive the engraving, as well as to save ink, and also time and labour in cleaning the plates or blocks. The manner in which I effect these objects will appear from an inspection of the Drawing, and the following description thereof:—A, A, &c., is the cast-iron frame of the press; B the upper cast-iron roller, on the axis of which is fixed the wheel C, with handles around it, for the workman to pull by; D, the lower cast-iron roller; E, F, the bed of the press, made partly of cast iron and partly of wood; the part E is of cast iron, the better to resist the pressure of the rollers, and to convey the heat employed to warm the plate or block, as described hereafter. The plate or block G is fixed upon the bed by means of screws passing through countersunk holes made in the bed from the under side of it, and into screwed holes made partly through the plate or block itself. The tympan H is a wooden frame covered with copper, and turning upon the hinges I, I, and having an aperture in it large enough to inclose the plate or block, the sides of which aperture are made feather-edged, so as to overlap the bevelled edges of the plate or block, and prevent them from soiling the paper. The cast-iron part of the bed of the press, with the plate or block upon it, is heated by means of a block of cast iron J, which is supported upon the plate K with turned-up edges, and which block is removed and replaced by another, from time to time, as it cools. In use, the frame of the press is inclined, the front end resting upon the floor, and the other end being raised by two screws passing through screwed holes in the sill of the press frame, one of which screws is shewn at L; the intention of this inclination is to cause the bed to return, after the impression is made, of its own accord; and in order to admit of this, a portion of the roller B is removed, and three pairs of additional rollers M, M, M, are added, for the bed to roll upon with more facility, each pair of rollers being fixed upon a separate axis, with necks working in brasses. The blankets N, N, are secured to the cast-iron bed at one end by the blanket holder O, and a stretcher P is affixed to the other end of them, from which cords Q, Q, pass over the pulleys R, R, and have weights (one of which is shewn at S) hung to them; by this means, the blankets are kept stretched and relieved from the roller, and prevented from matting or felting in use. The roller B is kept up, when the bed is released, by the following contrivance:—T, T, are two wooden blocks lying at the bottoms of the chases in the press frame; into each of these blocks is fitted a screwed nut U, Fig. 1, into which are screwed two screws (one of which is shewn at V, Fig. 1), having flat cylindrical heads W, W, with notches or teeth cut around them, and which project beyond the sides of the press frame, so as to be easily turned either way, as required. Upon these heads the brasses X, X, rest, in which the necks of



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the axis of the roller B turn, and the roller can thereby be supported at the required height, as above mentioned.

In Drawing No. 5 is represented a cylindrical steel or copper plate printing press. A, A, &c., is the cast-iron frame of the press; B, the main cylinder for  
 5 holding the plates, which has a solid cast-iron cylindrical surface or rim, upon which the plates are firmly secured by means of screws passing through holes made in the surface of the cylinder from the inside of it, and entering into screwed holes made partly through the plates. The main cylinder is mounted on an axis, with necks on each end of it, turning in brasses fixed upon the tops  
 10 of the two main upright standards of the press frame. C is the small cast-iron pressing cylinder, having necks upon its axis turning in sliding brasses, which can be adjusted so as to press with more or less force against the main cylinder B, by the screws, one of which is shewn at D. E, E, &c., is the endless web or blanket passing over and carried forwards by the pressing  
 15 cylinder C, and over the web cylinder F, the necks of the axis of, which cylinder turn in brasses fitted into sliding carriages with adjusting screws, one of which is shewn at G, for stretching the web. Upon the extended axis of the pressing cylinder C is fixed the drum or rigger H, which is driven by a band I, I, receiving its motion from the moving power. The plates J, J, &c.,  
 20 are inked by the roller K coming into contact with them in succession as the main cylinder revolves, and which roller is inked from the distributing rollers L and M, the latter of which receives the ink, in the usual manner of machine typographic printing presses, from a trough and ductor, and which, therefore, need not be here shewn. The ink is more uniformly distributed over the  
 25 plates by a hand roller used by a workman. Another ductor N is supported by brackets at each end of it to the main standards of the frame (one of which is shewn at O) in the usual manner of calico printing; and therefore need not be shewn here. This last-mentioned ductor N scrapes or takes off the larger portion of the ink lying upon the surfaces of the plates, the remainder being  
 30 removed by several persons wiping it off in succession, and finally cleaning their surfaces much in the same way as in copperplate printing. The paper, properly moistened, may be either laid upon the revolving web or blanket E, E, in sheets, and taken away when printed, or may be in the form of one or more long sheets, which must be previously wound upon the reel P, (the necks on  
 35 the axis of which turn in semicircular caps or notches made in the tops of standards affixed upon the frame of the machine, one of which is shewn at Q,) and be passed beneath the directing roller R, until it reaches the press, after passing through which, and becoming printed, it finally passes over the roller S, to be taken away. The courses of the endless web or blanket E, E, &c.,

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and of the long sheets of paper, are indicated by the arrows, which are shewn accompanying them in their progress. The standards which support the necks of the rollers K, L, M, and R are omitted in the Drawing, but must, of course, be employed in use.

In Drawing No. 6 is represented parts of a circular coining press, in which 5  
Fig. 1, is an end view; Fig. 2, a front view; Fig. 3, a section of Fig. 2; Fig. 4, a section of the cylinder in Fig. 1; and Fig. 5, a plan of the bed, lower die, and cutter.

A, a cast-iron cylinder, containing the upper coining die and male cutter; B, a cast-iron bed, containing the lower coining die and female cutter; C, the 10  
adjusting bed; D, D, the adjusting wedges of the lower die; E, the lever, which turns upon a pin or stud at one end of it, and by moving upwards raises the wedges D, D, and lower die resting upon them; F, the upper coining die and male cutter, shewn in Figures 3 and 4, and by dotted lines in Figures 1 and 2; G, the lower coining die shewn in Figs. 4 and 5, and by dotted lines in 15  
Figs. 1 and 2; H, the female cutter, shewn in Fig. 5, in section at Fig. 3, and by dotted lines in Figs. 1 and 2; I, the upper elastic circular wedge, shewn in section at Figs. 3 and 4, and by dotted lines in Figs. 1 and 2; J, the lower elastic circular wedge, shewn endways in Figure 5, by section in Fig. 3, and by dotted lines in Figs. 1 and 2; K, the screw for adjusting the upper die 20  
and cutter, shewn in Figures 3 and 4, and by dotted lines in Figs. 1 and 2; L, L, screws for securing the upper elastic circular wedge, shewn in Fig. 4, and by dotted lines in Figs. 1 and 2; M, the adjusting screw for the lower die, shewn in Figs. 1 and 3, and which is fixed to the lower of the two wedges D, D; N, the female screw or nut of the screw M, shewn in Figs. 1 and 5; O, 25  
in Fig. 2, the line affixed to the lever E, which is passed over a pulley (not shewn in the Drawing), and has a weight at its other end (likewise not shewn), which acts so as to raise the lower die G, and throw out the piece coined after having received the impression; P, Fig. 1, an end view of the adjusting bed Z of the vibrating lever press, described in Drawing No. 3. The cast-iron 30  
cylinder A is applied on the under side of the vibrating lever K of that press, by means of its cylindrical necks Q, Q, working in the gaps of the brass bearing box I, in the same manner as the die or roller j there described, and it may be turned or rolled backwards and forwards in the same manner, either by a double spanner, with circular holes in its ends, to fit upon the ends of the 35  
cylindrical necks Q, Q, and which are prevented from slipping round thereon by means of iron or steel webs or fins fitted into grooves R, R, (one of which is shewn at Fig. 2, and both by dotted lines in Fig. 1,) made in the necks, and projecting above their surfaces, fitting into corresponding gaps made in the



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- holes in the ends of the spanner to receive them, or it may have a vibrating motion given to it from any proper first moving power by means of a lever, connecting rod, and crank, or other means, which need not be described here. A groove or channel S, shewn in Figs. 1, 3, and 4, is made around the cast-iron cylinder A, to admit the slips of metal out of which the pieces are to be cut and coined (and which has previously been reduced to a proper width and thickness) to pass freely, and it has a perforation through the centre of it and at right angles to its axis, made of a proper shape to receive the various parts inclosed within it, as before described, as well as two others for the screws
- 10 L, L, to act in. The cylinder revolves upon the bed B, its surfaces A, A, being always in contact therewith. The bed B has a conical perforation T, T, made partly through it, shewn in section at Fig. 3, and by dotted lines in Figs. 1 and 2, to receive the conical elastic wedge J, and steel cylindrical ring or female cutter H, and a cylindrical hole U at the bottom of the conical perforation
- 15 T, T, to permit the lower die G to move freely up and down in it. The lower face of the upper coining die F has the head, &c., of the coin indented in it, and the upper face of the lower coining die G has the reverse indented in it, and the slip of metal is first cut into a circular blank by the male cutter or edge of the upper coining die as it revolves passing into the female cutter H, and acting partly as circular shears and partly as the beds and punches of cutting presses, at the same time that the dies give the impression on each side of the blank; and when the cylinder has passed the lever E, by means of the weight affixed to it, as before described, raises the lower die G, with the coin upon it, a little above the top of the female cutter H, and it is carried forwards
- 20 in the hole in the slip of metal out of which it was pressed or cut, and thrown off in its passage. The strip of metal is prevented from clinging to the upper die F, by two small hooks, under which the slip is passed, and which hooks are affixed on the bed B, though not there shewn. The upper wedge D has necks or pivots at one end of it V, V, Figs. 1 and 5, which lodge or rest in gaps or
- 30 notches made in two brasses W, W, which are screwed upon the adjusting bed C, and which allow that wedge to play up and down, but prevent it from moving endways; X is part of the arm a, described in the reference to Drawing No. 3. In order to decarbonate the surfaces of cast-steel plates, cylinders, or dies, by which they are rendered much softer and fit for transferring or
- 35 engraving designs thereon; I find that pure iron filings, divested of all foreign or extraneous matters produce the softest decarbonated surface, and therefore I use iron filings as pure and as free from rust as I can obtain them. I also carefully exclude all carbonaceous matter, and any substance from which carbon can be obtained. The stratum of decarbonated steel should not be too

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thick for transferring fine and delicate engravings; for instance, not more than three times the depth of the engraving. The surface of the steel may be decarbonated to any required thickness. To decarbonate it to a proper thickness for fine engravings, I expose it for four hours to a white heat, enclosed in a cast-iron box with a well closed lid. The sides of the cast-iron box I make at least three-quarters of an inch in thickness, and at least a thickness of half an inch of pure iron filings should cover or surround the cast steel surface to be decarbonated. The box should be suffered to cool very slowly, which may be effected by shutting off all access of air to the furnace, and covering it with a layer six or eight inches in thickness of fine cinders. Each side of the steel plate, cylinder, or die, must be equally decarbonated, to prevent it from springing or warping in hardening. I also find it much the safest way to heat the plates, cylinders, or dies in a vertical position. I make use of good cast steel in preference to any other sort of steel, for the purpose of making plates, cylinders, circular or other dies, and more especially when such plates, cylinders, or dies are intended to be decarbonated. For the reason given above, the steel is decarbonated solely for the purpose of rendering it sufficiently soft for receiving any impression intended to be made thereon. It is, therefore, necessary that after any piece of steel, whether in the shape of an engraved plate, or a cylinder, or a die, with engraved or other figures upon its surface, should be again carbonated or reconverted into steel capable of being hardened.

In order, therefore, to effect this carbonization or reversion into steel, I employ the following process. I take a suitable quantity of leather and convert it into charcoal by the well-known method of exposing it to a red heat in an iron retort for a sufficient length of time, or until all the evaporable matter is driven off from the leather. Having thus prepared the charcoal, I reduce it to a very fine powder; I then take a box, which I prefer having made of cast iron, of sufficient dimensions to receive the plate, cylinder, or die which I wish to have reconverted into steel, so as that the intermediate space between the sides of the said box and the plate, cylinder, or die may be about one inch. I fill the said box with the powdered charcoal, and having covered it with a well fitted lid, I place the box in a furnace similar to those used for melting brass; I increase the heat gradually until the box is somewhat above a red heat, and suffer it to remain in that state till all the evaporable matter is driven off from the charcoal. I then remove the lid from the box, and immerse the plate, cylinder, or die, in the powdered charcoal, taking care to place it as nearly in the middle as possible, so that it should be surrounded on all sides by a stratum of the powder of nearly an uniform thickness. I replace



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the lid, and suffer the box, with the plate, cylinder, or die, to remain in the degree of heat before described for from three to five hours, according to the thickness of the plate, cylinder, or die so exposed. Three hours are sufficient for a plate of half an inch in thickness, and five hours when the steel is one  
5 inch and a half in thickness. After the plate, cylinder, or die has been thus exposed to the fire for a sufficient length of time, I take it out from the box, and immediately plunge it into cold water. It is important here to observe, that I find the plates, or other pieces of steel, when plunged into cold water, are least liable to be warped or bent when they are held in a vertical position,  
10 or made to enter the water in the direction of their length. If a piece of steel, heated to a proper degree for hardening, be plunged into water, and suffered to remain there until it becomes cold, it is found by experience to be very liable to crack or break, and in many cases it would be found too hard for the operations it was intended to perform. If the steel cracks or breaks it is  
15 spoiled; and in order to render it fit for use, should it happen not to be broken in the hardening, it is the common practice to again heat the steel in order to reduce or lower its temper, as it is technically called. The degree of heat to which the steel is now exposed determines the future degree of hardness or the temper, and this is indicated by a change of colour upon the surface of the  
20 steel; during this heating a succession of shades is produced, from a very pale straw colour to a deep blue. I have found, however, by long experience that if on plunging the heated steel into cold water, and suffering it to remain there no longer than is sufficient for lowering the temperature of the steel to the same degree as that to which a hard piece of steel must have been raised in order  
25 to temper it in the common way, that it not only produces the same degree of hardness in the steel, but what is of much more importance, almost entirely does away the risk or liability of its cracking or breaking. I believe it to be impossible to communicate by words, or to describe the criterion by which, after long experience, I judge or determine when the steel has arrived at the  
30 proper degree of temperature after being plunged into cold water; and I believe that it can only be learned by actual observation, as I am guided entirely by the kind of hissing or singing noise which the heated steel produces in the water whilst cooling. From the moment of its being first plunged into the water a varying sound will be observed, and it is at a certain period before  
35 the noise ceases that I find the effect to be produced, and the only directions I can give by which the experimentalist can be benefitted is as follows, namely, to take a piece of steel which has already been hardened by remaining in the water till cold, and by the common method of again heating it, to let it be brought to the colour which would indicate the desired temper

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of the steel plate to be hardened by my process; and so soon as he discovers the colour to be that of pale yellow or straw colour, to dip the steel into water, and attend carefully to the hissing, or as some call it the singing noise, which it occasions. He will then be better able, and with fewer experiments, to judge of the precise time at which it should be taken out. I do not mean it 5 to be understood that the temper indicated by a straw colour is that to which the steel plate, cylinder, or die should be reduced, because it would then be found too hard, but merely that the temperature which would produce that colour is that by which the peculiar sound would be occasioned when the steel should be withdrawn from the water for the first time. Immediately on 10 withdrawing it from the water the steel plate, cylinder, or die must be laid upon or held over a fire, and heated uniformly until its temperature is raised to that degree at which tallow would be decomposed, or, in other words, until smoke is perceived to arise from the surface of the steel plate, cylinder, or die, after having been rubbed with tallow. The steel plate, cylinder, or die must 15 then be again plunged into water, and kept there until the sound becomes somewhat weaker than before; it is then to be taken out and heated a second time to the same degree, and by the same rule of smoaking tallow as before, and the third time plunged into water till the sound becomes again weaker than the last; expose it a third time to the fire as before, and for the last time 20 return it into the water and cool it. After it is cooled, clean the surface of the steel plate, cylinder, or die, and by heating it over the fire the temper must be reduced by bringing on a brown or such other lighter or darker shade of colour as may best suit the quality of the steel, or the purpose to which it is to be applied. 25

Although I have particularly described the process I employ for hardening or tempering steel plates, cylinders, or dies, and although I believe the major part of the said process to be new, yet I do not mean to claim any of the privileges granted to me by the aforesaid recited Letters Patent for the exclusive use of the said process. I have also herein-before described certain 30 machinery, which I have denominated a horizontal vibrating lever press, as applicable to the transferring of engraved or other work from the surface of one piece of metal to another piece of metal, and which horizontal vibrating lever press is represented by the Drawing No. 3, Figures 1, 2, 3, and 4.

And whereas I have described the aforesaid press to consist of a wooden 35 frame of bars, of metal beds, of levers, pins, &c., &c. I do not claim any of these in their individual characters as forming any part of my said Invention.

This part of my Invention consists in such a combination of the several parts of the aforesaid horizontal vibrating lever press as renders it applicable



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to the purposes herein-before mentioned; namely, transferring of engraved or other work from the surface of one piece of metal to the surface of another piece of metal in a manner not heretofore accomplished, and rendering it capable of being used for the purpose of forming metallic dies, matrices for  
 5 coining money, stamping metals, and other useful purposes. But as the Invention of transferring engraved or other work from the surface of steel rollers or indenting cylinders is not new, I shall proceed to shew in what the novelty and peculiarity of my said Invention of transferring engraved or other work from the surface of one piece of metal to another piece of metal, consists,  
 10 which is as follows, namely, that I first procure an engraving of any kind whatsoever to be made upon a decarbonated steel plate, as has been herein-before described, and by means of my aforesaid Invention of an horizontal vibrating lever press I am enabled to transfer such engraving to the decarbonated surface of a steel cylinder or circular die in such a manner that  
 15 the surface of the said cylinder becomes an exact counterpart of the aforesaid engraved plate, or, in other words, a circular punch which, when hardened, may be used for making other steel plates, which other steel plates may again be employed for making other cylinders or circular dies almost to an indefinite extent, without in the least altering the identity so desirable to be preserved  
 20 in the multiplication of the plates and prints intended as exact copies of the original engraving.

I will proceed to describe such parts of the machinery and implements mentioned in the Letters Patent herein-before recited, and as is therein stated to have been received or to have come into my possession through communication by a certain foreigner, when residing in America, namely, the Invention  
 25 of certain machinery and implements applicable to ornamental turning and engraving. I do not intend here to describe ornamental turning or engraving as forming part of such communication, nor to claim any exclusive privilege for the making, using, or vending rose engines, or any other of the well-known machines which have been long used for such purposes as ornamental  
 30 turning or engraving; the peculiarity and novelty of the aforesaid Invention so communicated to me will best appear by first stating that by the rose engine and other machines heretofore used for ornamental turning, &c., the mandrell to which the substance to be ornamented or engraved was attached,  
 35 received or had communicated to it a lateral or longitimal motion during its rotation round its axis, according to the varying form or direction of the figures or lines to be described upon the said substance by a lateral motion, I mean a motion of the mandrell at right angles to its axis, and by longitudinal motion, that which carries it backwards and forwards in a direction parallel

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with its axis. These motions (namely, the lateral and longitudinal,) might be produced separately, or (at the discretion of the artist) conjointly, so as to make the mandrell move in a direction at any intermediate angle between the lateral and longitudinal directions, as before described. The method hitherto used in producing the several motions of the mandrell, as before described, is that of fixing rosettes or variously shaped pieces of metal upon the mandrell; but as this is a well-known expedient among rose engine makers, I need not give a more particular description thereof. 5

The Invention communicated to me, as herein-before described, consists in producing a lateral motion of the mandrell by means of the eccentric cylinder or other shaped body upon a seprate axis and of varying the number of lateral motions of the mandrell during one revolution thereof, by means of wheels of various diameters, as have been herein-before described, the references to Drawing No. 1 hereunto annexed. And also in producing the longitudinal motion of the mandrell by a different modification of the same expedient in No. 2 of the said Drawings. 10 15

The improvements claimed by me in the copper or steel plate or block printing press described in the references to Drawing No. 4 are simply the substitution of a metal bed in place of the usual wooden ones, whereby the copper or steel plates or blocks may be heated by means of a iron heater, 20 or by steam if preferred, and enabling me to fix the plate or block firmly and evenly to the metal bed; and the use of the tympan, to save ink and trouble in inking and cleaning the plate or block.

The improvements claimed by me in the cylindrical steel or copper plate printing press described in the references to Drawing No. 5, consist in affixing a number of engraved circular plates to the surface of a cylinder, so that the operation of inking the plates, wiping, and cleaning, and printing from the said plates shall be simultaneous and continuous. 25

My improved method of making and using dies and presses for coining money, stamping metals, and other useful purposes, consists:— 30

First, in making dies in a similar manner to that herein-before described for transferring engravings from the surface of one piece of metal to another piece of metal, whereby I am enabled to produce almost an infinite number of dies, which shall in like manner be exact copies of the original.

Secondly, in the coining of money with a roller press and circular die, by which the blank is cut out of the plate of metal, and the impression is given by the dies at the same time; one of the dies being made circular on the face, the impression is given progressively as it rolls over the coin, whereby the operation requires less pressure, and the die is not so liable to be broken 35



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as when the coining is performed by a blow, and both the operations of cutting and coining being performed at once it is a saving of time. The original dies being made flat or plane as usual, only a little larger than ordinary, a decarbonated circular die, fitted to the horizontal vibrating lever press, as  
 5 before described, is made to roll backwards and forwards under a sufficient pressure upon the face of one of the dies, fixed securely upon the adjusting bed, until it has received an impression therefrom in bas-relief; the circular die being then hardened becomes a substitute for what is termed a hubb or puncheon in the ordinary process of die sinking, but in a superior manner,  
 10 being capable of receiving and giving the entire obverse or reverse of the coin, &c.; when employed to make other flat or plane dies, they may also be used to sink the dies to be used in the circular coining press, described in the reference to the Drawing No. 6.

15 In witness whereof, I, the said Jacob Perkins (party hereto), have hereunto set my hand and seal, this Tenth day of April, One thousand eight hundred and twenty.

JACOB (L.S.) PERKINS.

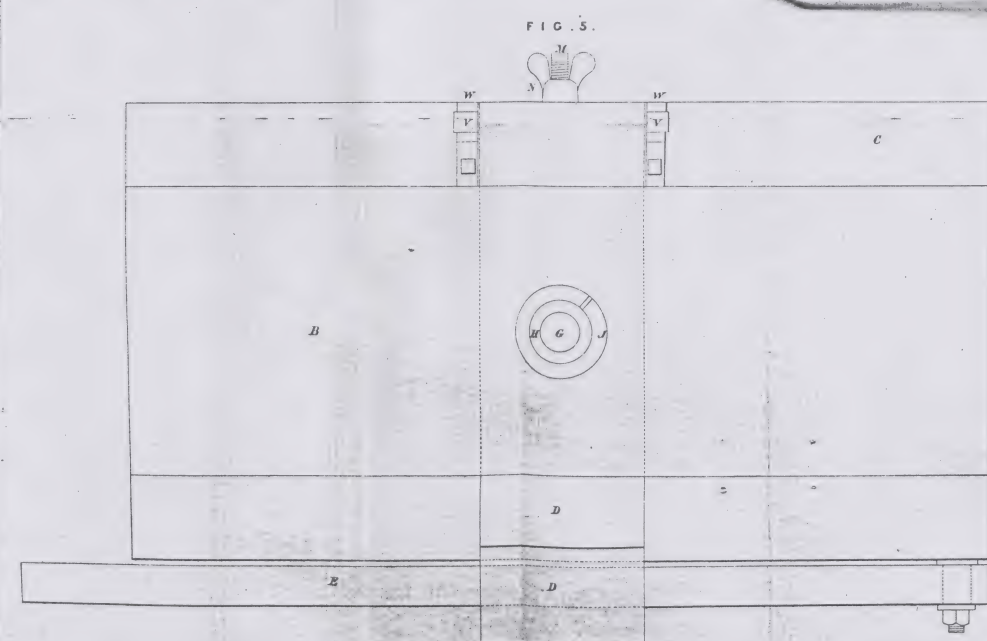
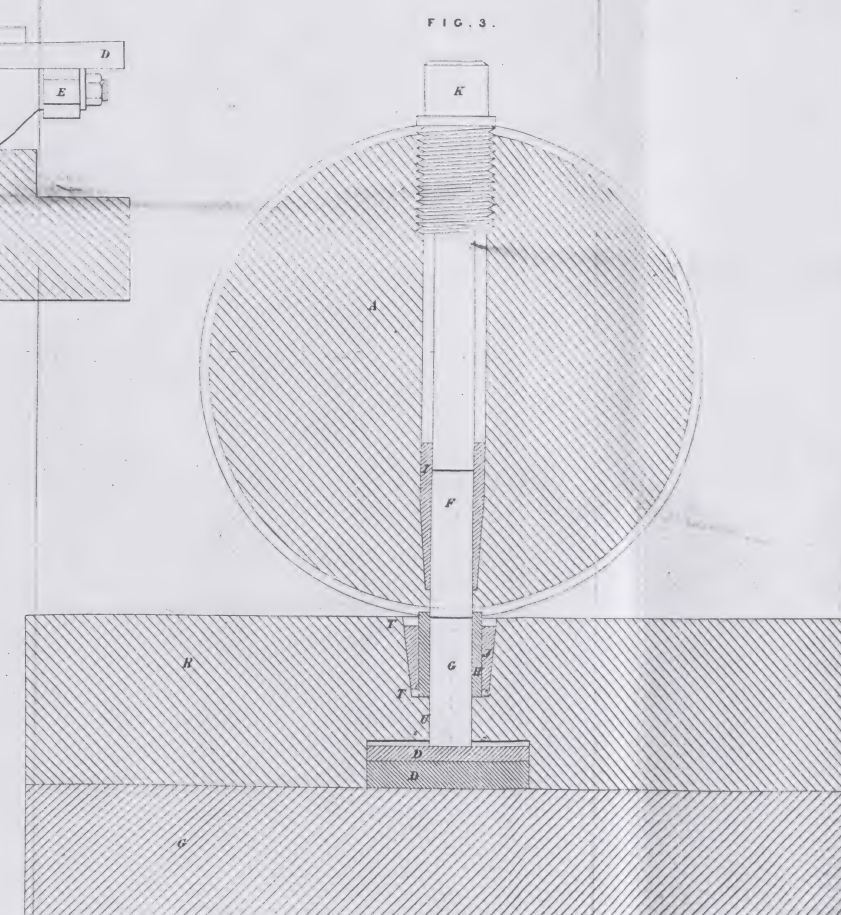
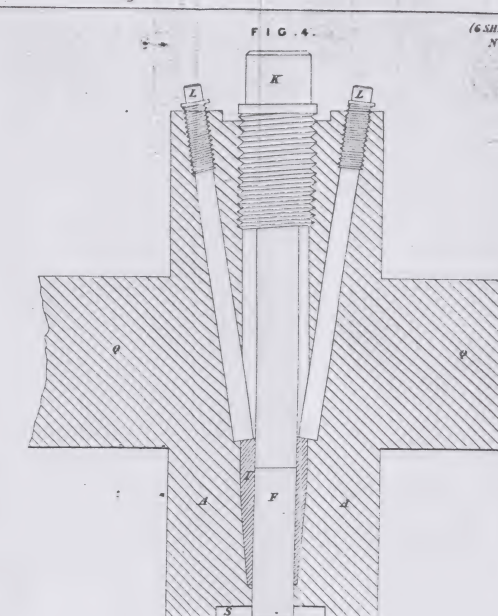
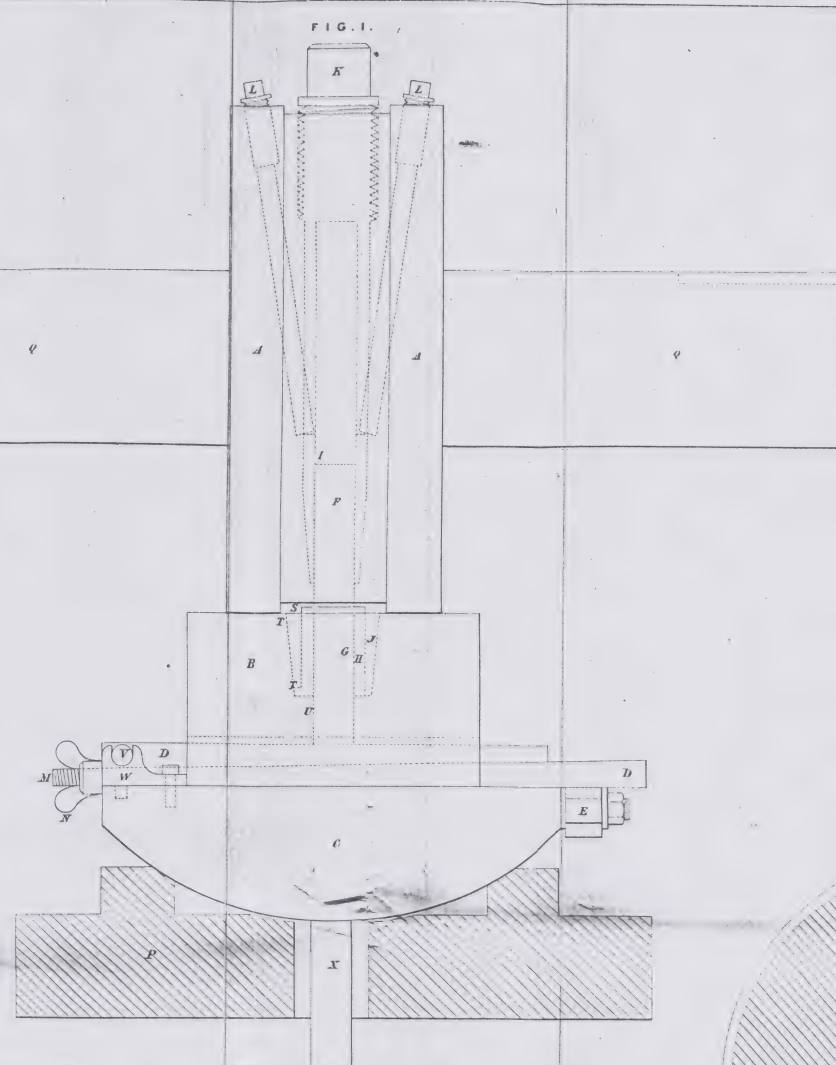
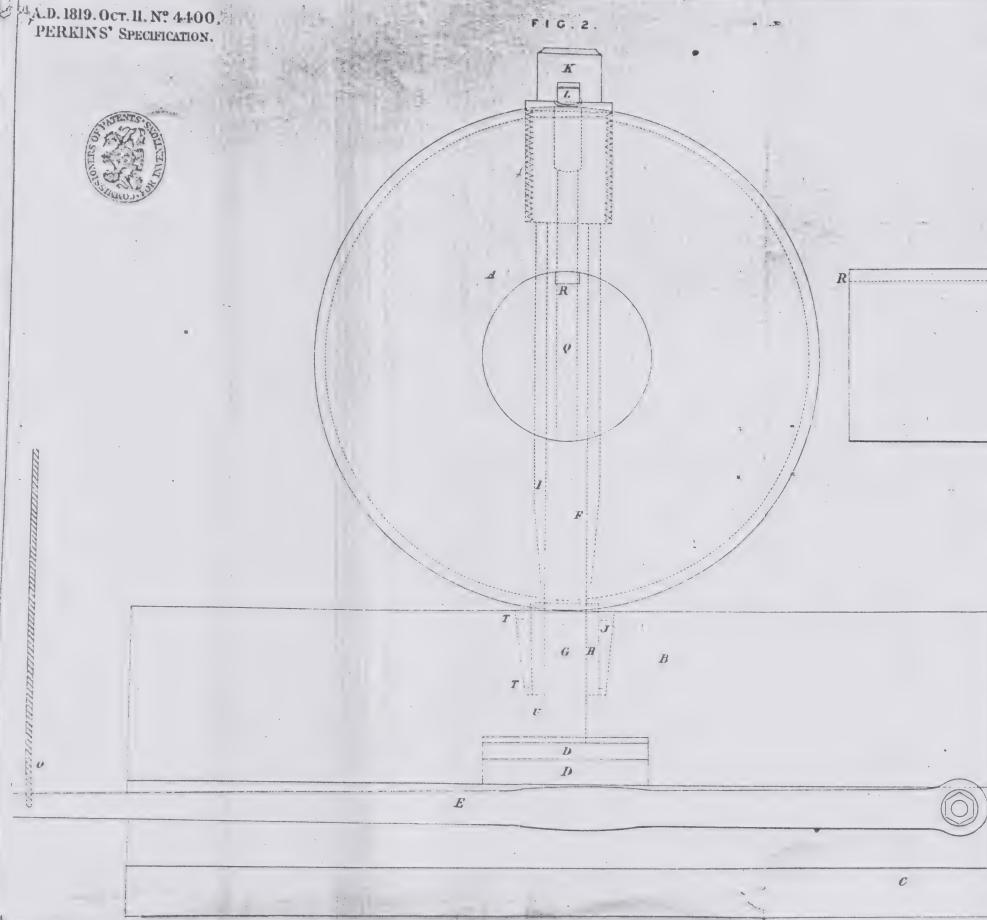
AND BE IT REMEMBERED, that on the Tenth day of April, in the year  
 of our Lord 1820, the aforesaid Jacob Perkins came before our said Lord  
 20 the King in His Chancery, and acknowledged the Specification aforesaid, and all and every thing therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statutes made for that purpose.

25 Inrolled the Tenth day of April, in the year of our Lord One thousand eight hundred and twenty.

LONDON:

Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,  
 Printers to the Queen's most Excellent Majesty. 1857.



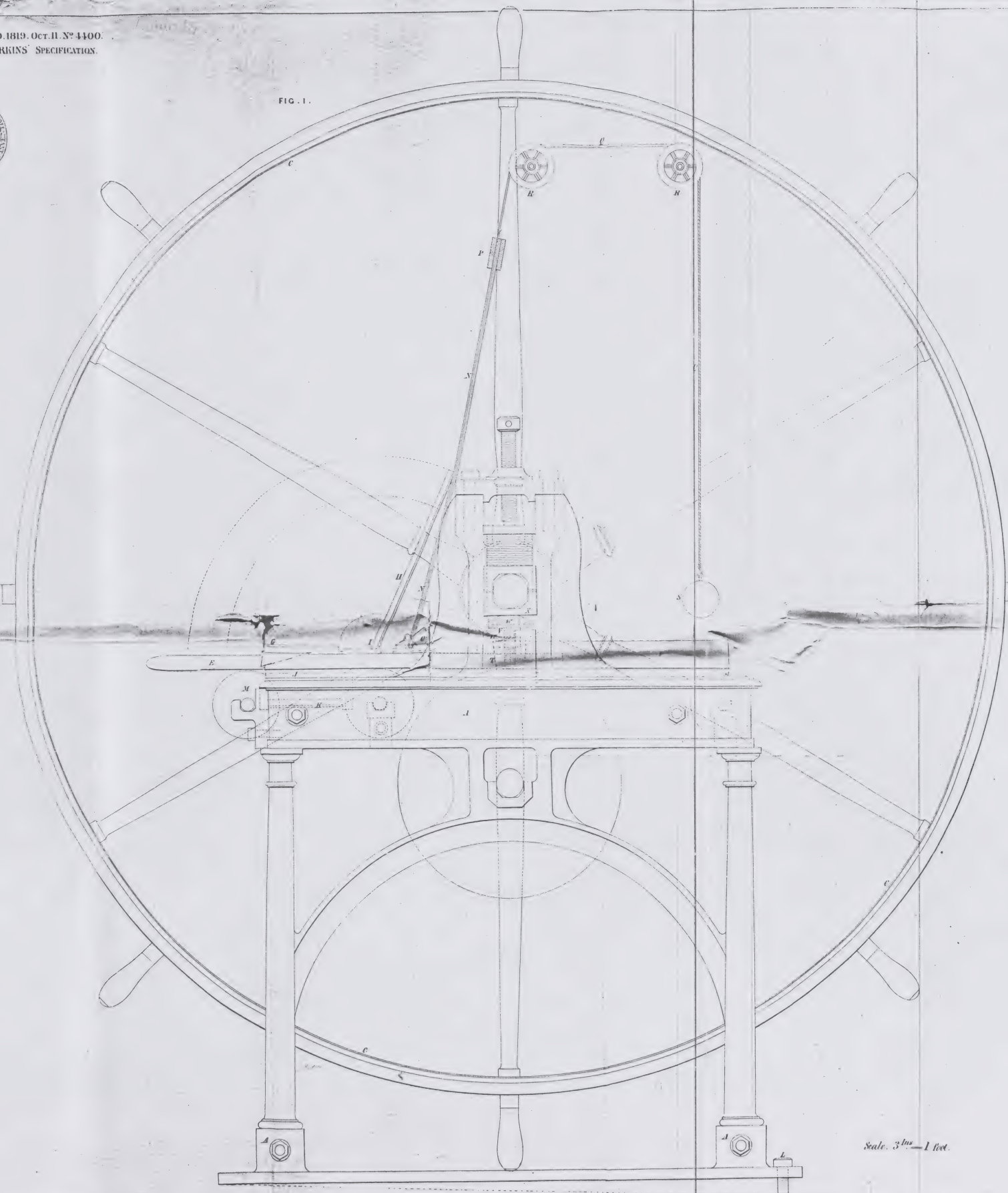


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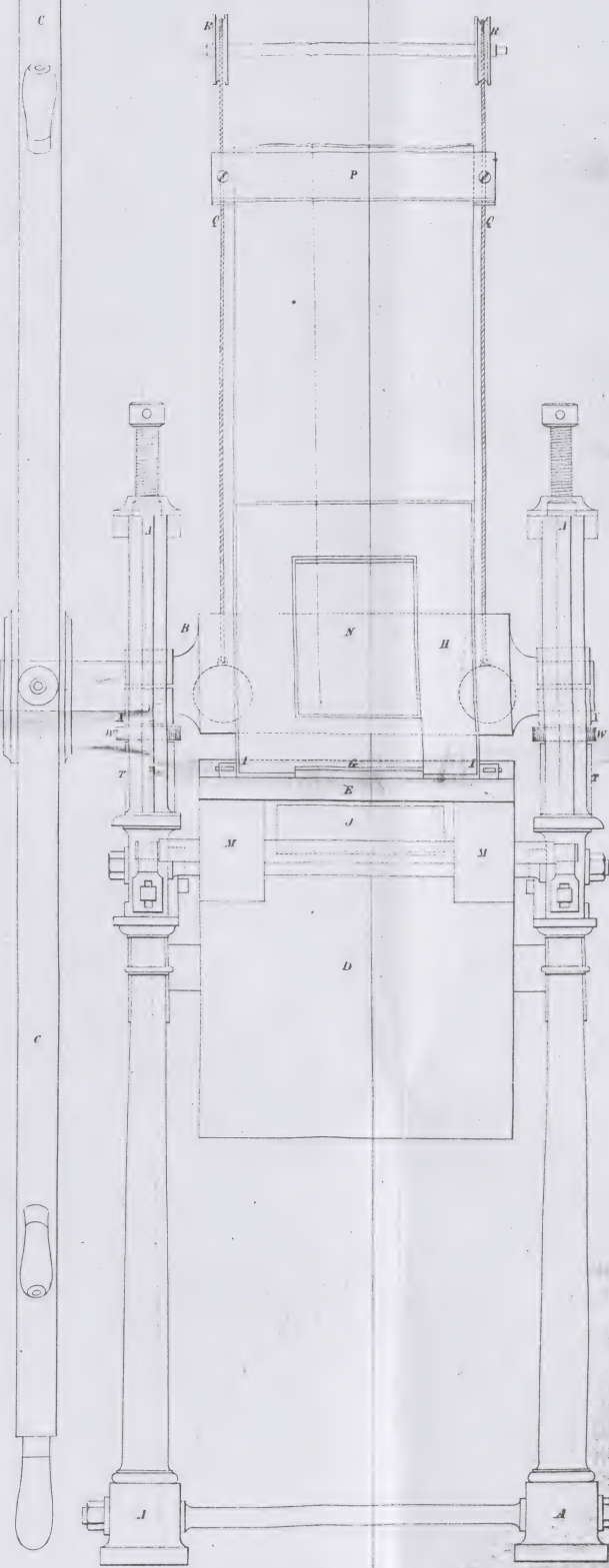


FIG. 1.



Scale. 3 in = 1 foot.

FIG. 2.



The engrav'd drawing is colored.

LONDON: Printed by GEORGE EDWARDS, at the 'SUN' in Pall Mall.

Drawn and Engraved by M. & S.



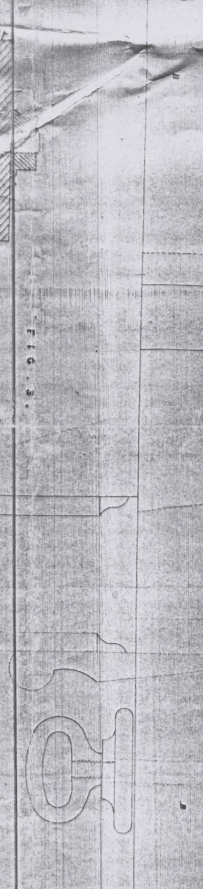
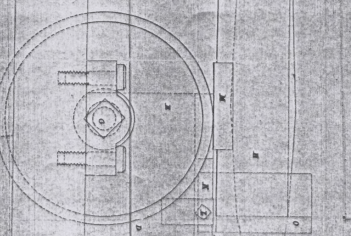
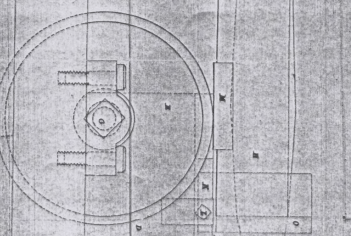
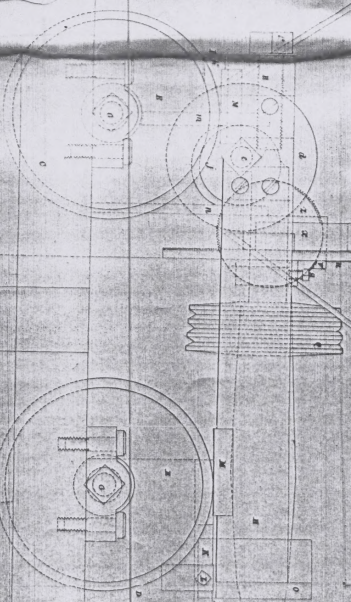
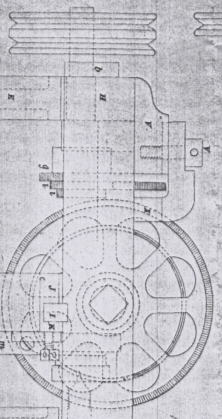
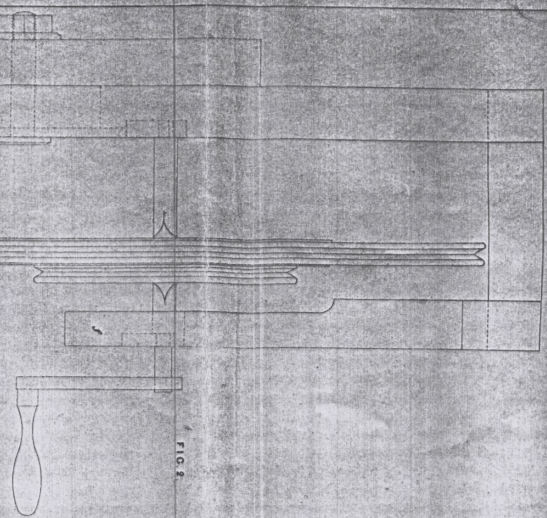


FIG. 7

Scale 6 inches = one foot.

FIG. 8

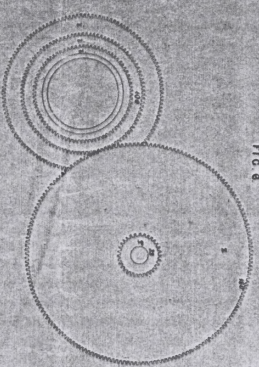
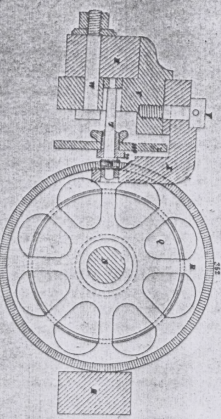


FIG. 9

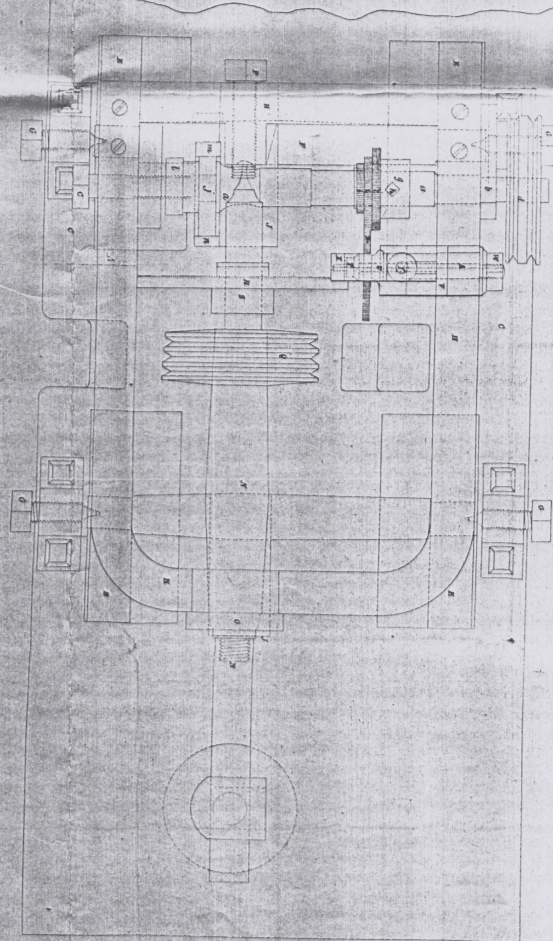
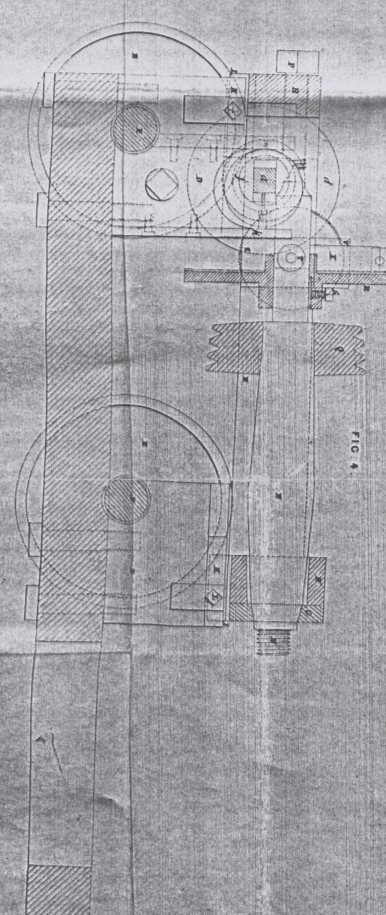


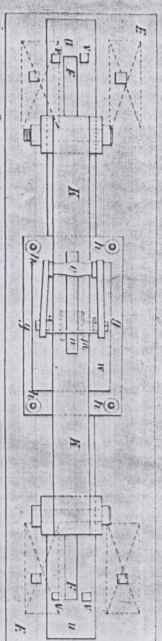
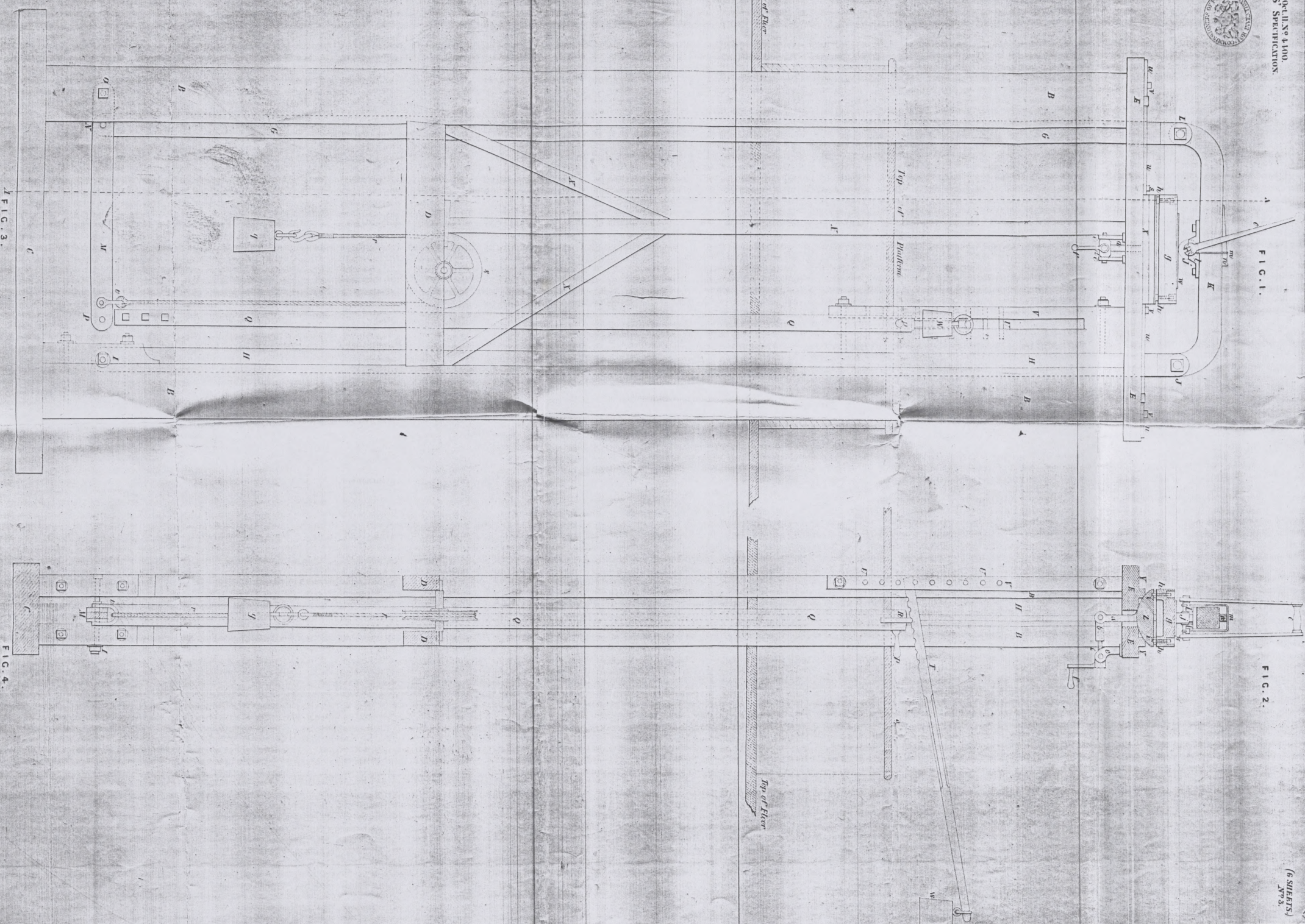
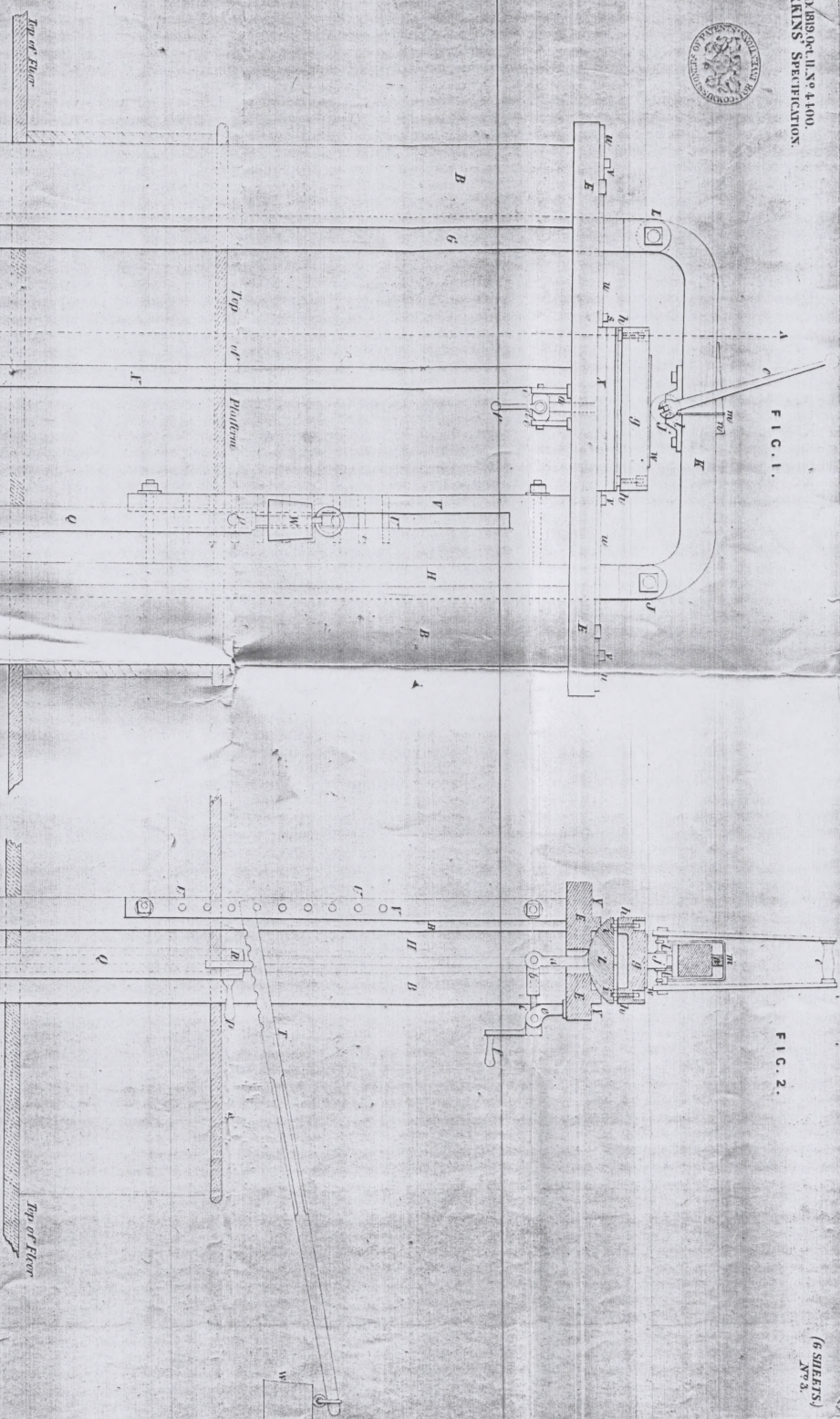
FIG. 10



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PERKINS SPECIFICATIONS





*The curled drawing is a larva*

Sailor

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Printers to the Queen's most Excellent Majesty 1857.

Drawn on Steel by Maffey & Sons

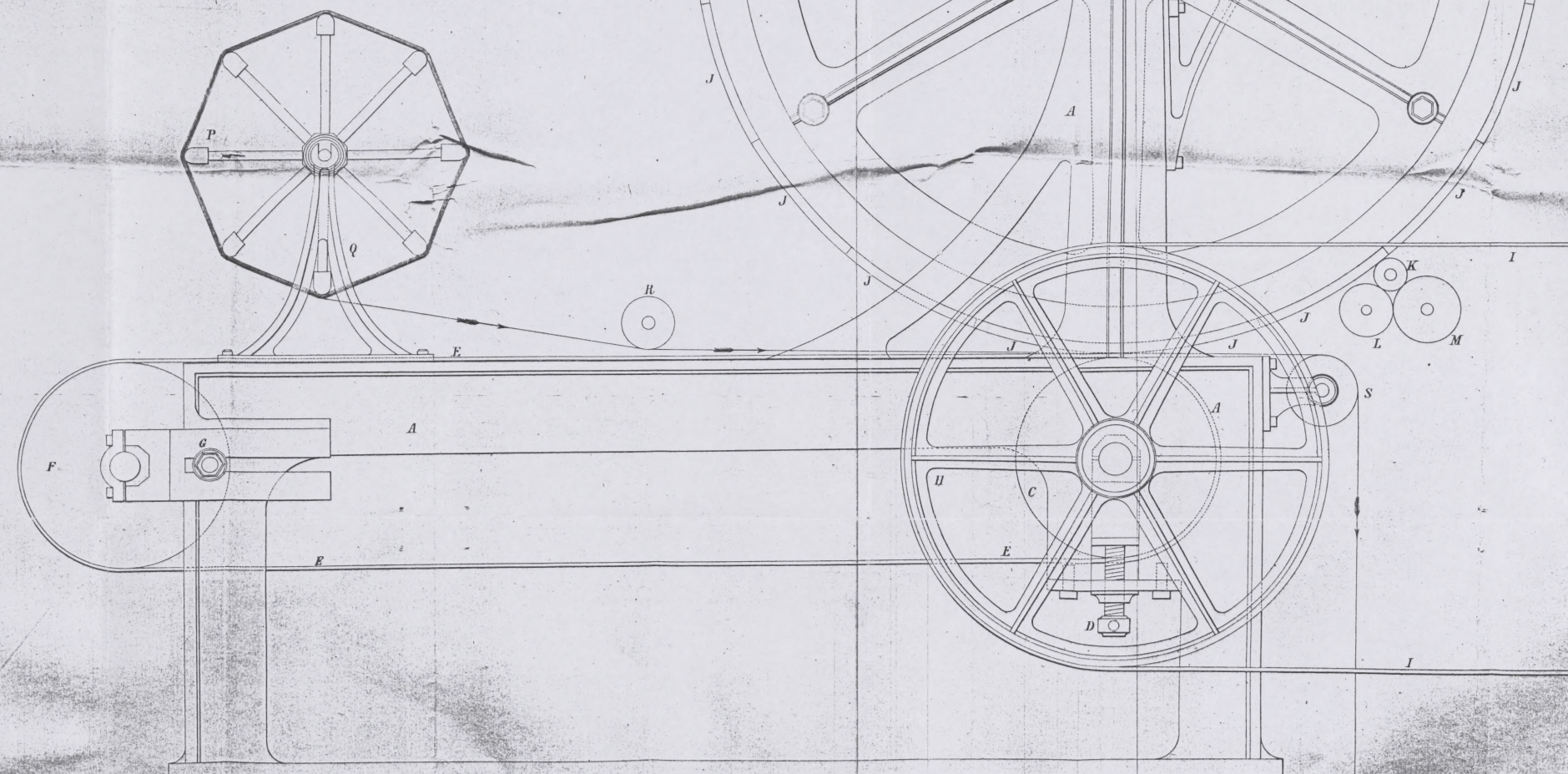




Scale.

0 1 2 3 4 5 6 7 8 9 10 11 12 Inches

3 Fee



The enrolled drawing is colored.

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Printers to the Queen's most Excellent Majesty, 1857.

Drawn on Stone by Malby & Sons



